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      Botterman, Johan
      Van Rie, Jeroen
      Joos, Henk

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CRYSTAL PROTEINS

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<140> 09/661,061

<141> September 13, 2000

<150> PCT/EP90/00905
<151> 1990-05-30

<150> GB 89401499.2
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Pro Tyr Asn Cys Leu Ser Asn Pro Lys Glu Ile Ile Leu Gly Glu Glu
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agg cta gaa aca ggg aat act gta gca gac att tca tta ggg ctt att   389
Arg Leu Glu Thr Gly Asn Thr Val Ala Asp Ile Ser Leu Gly Leu Ile
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Asn Phe Leu Tyr Ser Asn Phe Val Pro Gly Gly Gly Phe Ile Val Gly
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75   80   85   90

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Ala Arg Asn Gln Ala Ile Ser Arg Leu Glu Gly Leu Ser Asn Leu Tyr
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aag gtc tat gtt aga gcg ttt agc gac tgg gag aaa gat cct act aat   629
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Pro Ala Leu Arg Glu Glu Met Arg Ile Gln Phe Asn Asp Met Asn Ser
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155   160   165   170

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Thr Ile Asn Asn Arg Tyr Ser Asp Leu Thr Ser Leu Ile His Val Tyr
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act aac cat tgt gtg gat acg tat aat cag gga tta agg cgt ttg gaa   917
Thr Asn His Cys Val Asp Thr Tyr Asn Gln Gly Leu Arg Arg Leu Glu
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Gly Arg Phe Leu Ser Asp Trp Ile Val Tyr Asn Arg Phe Arg Arg Gln
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235   240   245   250

att aga aca tat cca att caa aca gct act cag cta acg agg gaa gtc   1061
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tat cca acc ttt tca gct gct gaa agt gct ata att aga agt cct cat   1157
Tyr Pro Thr Phe Ser Ala Ala Glu Ser Ala Ile Ile Arg Ser Pro His
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acc act act aat ttg ata aga tcc cct tta tat gga agg gaa gga aat      1301
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aca gag cgc ccc gta act att acc gca tca cct agc gta cca ata ttt      1349
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aga aca ctt tca tat att aca ggc ctt gac aat tca aat cct gta gct      1397
Arg Thr Leu Ser Tyr Ile Thr Gly Leu Asp Asn Ser Asn Pro Val Ala
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gga atc gag gga gtg gaa ttc caa aat act ata agt aga agt atc tat      1445
Gly Ile Glu Gly Val Glu Phe Gln Asn Thr Ile Ser Arg Ser Ile Tyr
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gcc agc gta tct cct gca att ggg tat agt cac cgt tta tgc cat gca      1541
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aca ttt tta gaa cgg att agt gga cca aga ata gca ggc acc gta ttt      1589
Thr Phe Leu Glu Arg Ile Ser Gly Pro Arg Ile Ala Gly Thr Val Phe
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tct tgg aca cac cgt agt gcc agc cct act aat gaa gta agt cca tct      1637
Ser Trp Thr His Arg Ser Ala Ser Pro Thr Asn Glu Val Ser Pro Ser
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aga att aca caa att cca tgg gta aag gcg cat act ctt gca tct ggt      1685
Arg Ile Thr Gln Ile Pro Trp Val Lys Ala His Thr Leu Ala Ser Gly
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gcc tcc gtc att aaa ggt cct gga ttt aca ggt gga gat att ctg act      1733
Ala Ser Val Ile Lys Gly Pro Gly Phe Thr Gly Gly Asp Ile Leu Thr
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agg aat agt atg ggc gag ctg ggg acc tta cga gta acc ttc aca gga      1781
Arg Asn Ser Met Gly Glu Leu Gly Thr Leu Arg Val Thr Phe Thr Gly
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ttc gct cat aca aca ctc ttc act cca ata acc ttt tca cga gct caa    1973
Phe Ala His Thr Thr Leu Phe Thr Pro Ile Thr Phe Ser Arg Ala Gln
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gaa gaa ttt gat cta tac atc caa tcg ggt gtt tat ata gat cga att    2021
Glu Glu Phe Asp Leu Tyr Ile Gln Ser Gly Val Tyr Ile Asp Arg Ile
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gaa ttt ata ccg gtt act gca aca ttt gag gca gaa tat gat tta gaa    2069
Glu Phe Ile Pro Val Thr Ala Thr Phe Glu Ala Glu Tyr Asp Leu Glu
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aga gcg caa aag gtg gtg aat gcc ctg ttt acg tct aca aac caa cta    2117
Arg Ala Gln Lys Val Val Asn Ala Leu Phe Thr Ser Thr Asn Gln Leu
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ggg cta aaa aca gat gtg acg gat tat cat att gat cag gta tcc aat    2165
Gly Leu Lys Thr Asp Val Thr Asp Tyr His Ile Asp Gln Val Ser Asn
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cta gtt gcg tgt tta tcg gat gaa ttt tgt ctg gat gaa aag aga gaa    2213
Leu Val Ala Cys Leu Ser Asp Glu Phe Cys Leu Asp Glu Lys Arg Glu
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ttg tcc gag aaa gtt aaa cat gca aag cga ctc agt gat gag cgg aat    2261
Leu Ser Glu Lys Val Lys His Ala Lys Arg Leu Ser Asp Glu Arg Asn
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tta ctt caa gat cca aac ttc aga ggg atc aat agg caa cca gac cgt    2309
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ggc tgg aga gga agt acg gat att act atc caa gga gga gat gac gta    2357
Gly Trp Arg Gly Ser Thr Asp Ile Thr Ile Gln Gly Gly Asp Asp Val
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ttc aaa gag aat tac gtt acg cta ccg ggt acc ttt gat gag tgc tat    2405
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cca acg tat tta tat caa aaa ata gat gag tcg aaa tta aaa gcc tat    2453
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atc tat tta att cgt tac aat gca aaa cac gaa ata gta aat gta cca    2549
Ile Tyr Leu Ile Arg Tyr Asn Ala Lys His Glu Ile Val Asn Val Pro
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ggt aca gga agt tta tgg cct ctt tct gta gaa aat caa att gga cct    2597
Gly Thr Gly Ser Leu Trp Pro Leu Ser Val Glu Asn Gln Ile Gly Pro
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tgt gga gaa ccg aat cga tgc gcg cca cac ctt gaa tgg aat cct gat    2645
Cys Gly Glu Pro Asn Arg Cys Ala Pro His Leu Glu Trp Asn Pro Asp
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Leu His Cys Ser Cys Arg Asp Gly Glu Lys Cys Ala His His Ser His
795                 800                 805                 810

cat ttc tct ttg gac att gat gtt gga tgt aca gac tta aat gag gac    2741
His Phe Ser Leu Asp Ile Asp Val Gly Cys Thr Asp Leu Asn Glu Asp
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tta ggt gta tgg gtg ata ttc aag att aag acg caa gat ggc cac gca    2789
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cga cta ggg aat cta gag ttt ctc gaa gag aaa cca tta tta gga gaa    2837
Arg Leu Gly Asn Leu Glu Phe Leu Glu Glu Lys Pro Leu Leu Gly Glu
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gca cta gct cgt gtg aaa aga gcg gag aaa aaa tgg aga gac aaa cgc    2885
Ala Leu Ala Arg Val Lys Arg Ala Glu Lys Lys Trp Arg Asp Lys Arg
    860                 865                 870

gaa aca tta caa ttg gaa aca act atc gtt tat aaa gag gca aaa gaa    2933
Glu Thr Leu Gln Leu Glu Thr Thr Ile Val Tyr Lys Glu Ala Lys Glu
875                 880                 885                 890

tct gta gat gct tta ttt gta aac tct caa tat gat aga tta caa gcg    2981
Ser Val Asp Ala Leu Phe Val Asn Ser Gln Tyr Asp Arg Leu Gln Ala
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gat acg aac atc gcg atg att cat gcg gca gat aaa cgc gtt cat aga    3029
Asp Thr Asn Ile Ala Met Ile His Ala Ala Asp Lys Arg Val His Arg
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att cga gaa gcg tat ctg ccg gag ctg tct gtg att ccg ggt gtc aat    3077
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cta tat gat gcg aga aat att att aaa aat ggc gat ttc aat aat ggc      3173
Leu Tyr Asp Ala Arg Asn Ile Ile Lys Asn Gly Asp Phe Asn Asn Gly
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tta tta tgc tgg aac gtg aaa ggg cat gta gag gta gaa gaa caa aac      3221
Leu Leu Cys Trp Asn Val Lys Gly His Val Glu Val Glu Glu Gln Asn
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aat cac cgt tca gtc ctg gtt atc cca gaa tgg gag gca gaa gtg tca      3269
Asn His Arg Ser Val Leu Val Ile Pro Glu Trp Glu Ala Glu Val Ser
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caa gag gtt cgt gtc tgt cca ggt cgt ggc tat atc ctt cgt gtt aca      3317
Gln Glu Val Arg Val Cys Pro Gly Arg Gly Tyr Ile Leu Arg Val Thr
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gcg tac aaa gag gga tat gga gaa ggt tgc gta acg atc cat gag atc      3365
Ala Tyr Lys Glu Gly Tyr Gly Glu Gly Cys Val Thr Ile His Glu Ile
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gag aac aat aca gac gaa ctg aaa ttc aac aac tgt gta gaa gag gaa      3413
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gta tat cca aac aac acg gta acg tgt att aat tat act gcg act caa      3461
Val Tyr Pro Asn Asn Thr Val Thr Cys Ile Asn Tyr Thr Ala Thr Gln
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Asn Arg Gly Tyr Gly Asp Tyr Thr Pro Leu Pro Ala Gly Tyr Val Thr
1115                1120                1125                1130

aag gaa tta gag tac ttc cca gag acc gat aag gta tgg att gag att      3701
Lys Glu Leu Glu Tyr Phe Pro Glu Thr Asp Lys Val Trp Ile Glu Ile
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atg gag gaa tag gaccatccga gtatagcagt ttaataaata ttaattaaaa    3801
Met Glu Glu
         1165


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Thr Val Ala Asp Ile Ser Leu Gly Leu Ile Asn Phe Leu Tyr Ser Asn
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Phe Val Pro Gly Gly Gly Phe Ile Val Gly Leu Leu Glu Leu Ile Trp
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Gly Phe Ile Gly Pro Ser Gln Trp Asp Ile Phe Leu Ala Gln Ile Glu
 65                  70                  75                  80

Gln Leu Ile Ser Gln Arg Ile Glu Glu Phe Ala Arg Asn Gln Ala Ile
             85                  90                  95

Ser Arg Leu Glu Gly Leu Ser Asn Leu Tyr Lys Val Tyr Val Arg Ala
             100                 105                 110

Phe Ser Asp Trp Glu Lys Asp Pro Thr Asn Pro Ala Leu Arg Glu Glu
             115                 120                 125

Met Arg Ile Gln Phe Asn Asp Met Asn Ser Ala Leu Ile Thr Ala Ile
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Pro Leu Phe Arg Val Gln Asn Tyr Glu Val Ala Leu Leu Ser Val Tyr
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Val Gln Ala Ala Asn Leu His Leu Ser Ile Leu Arg Asp Val Ser Val
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Trp Ile Val Tyr Asn Arg Phe Arg Arg Gln Leu Thr Ile Ser Val Leu
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Asp Ile Val Ala Phe Phe Pro Asn Tyr Asp Ile Arg Thr Tyr Pro Ile
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Gln Thr Ala Thr Gln Leu Thr Arg Glu Val Tyr Leu Asp Leu Pro Phe
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Ile Asn Gln Asn Leu Ser Pro Ala Ala Ser Tyr Pro Thr Phe Ser Ala
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Ala Glu Ser Ala Ile Ile Arg Ser Pro His Leu Val Asp Phe Leu Asn
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Ser Phe Thr Ile Tyr Thr Asp Ser Leu Ala Arg Tyr Ala Tyr Trp Gly
305                 310                 315                 320

Gly His Leu Val Asn Ser Phe Arg Thr Gly Thr Thr Thr Asn Leu Ile
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Arg Ser Pro Leu Tyr Gly Arg Glu Gly Asn Thr Glu Arg Pro Val Thr
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Ile Thr Ala Ser Pro Ser Val Pro Ile Phe Arg Thr Leu Ser Tyr Ile
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Thr Gly Leu Asp Asn Ser Asn Pro Val Ala Gly Ile Glu Gly Val Glu
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Phe Gln Asn Thr Ile Ser Arg Ser Ile Tyr Arg Lys Ser Gly Pro Ile
385                 390                 395                 400

Asp Ser Phe Ser Glu Leu Pro Pro Gln Asp Ala Ser Val Ser Pro Ala
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Ile Gly Tyr Ser His Arg Leu Cys His Ala Thr Phe Leu Glu Arg Ile
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Ser Gly Pro Arg Ile Ala Gly Thr Val Phe Ser Trp Thr His Arg Ser
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Pro Gly Phe Thr Gly Gly Asp Ile Leu Thr Arg Asn Ser Met Gly Glu
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Leu Gly Thr Leu Arg Val Thr Phe Thr Gly Arg Leu Pro Gln Ser Tyr
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Tyr Ile Arg Phe Arg Tyr Ala Ser Val Ala Asn Arg Ser Gly Thr Phe
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Arg Tyr Ser Gln Pro Pro Ser Tyr Gly Ile Ser Phe Pro Lys Thr Met
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Asp Ala Gly Glu Pro Leu Thr Ser Arg Ser Phe Ala His Thr Thr Leu
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Asn Ala Leu Phe Thr Ser Thr Asn Gln Leu Gly Leu Lys Thr Asp Val
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Thr Asp Tyr His Ile Asp Gln Val Ser Asn Leu Val Ala Cys Leu Ser
625   630   635   640

Asp Glu Phe Cys Leu Asp Glu Lys Arg Glu Leu Ser Glu Lys Val Lys
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His Ala Lys Arg Leu Ser Asp Glu Arg Asn Leu Leu Gln Asp Pro Asn
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Phe Arg Gly Ile Asn Arg Gln Pro Asp Arg Gly Trp Arg Gly Ser Thr
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Asp Ile Thr Ile Gln Gly Gly Asp Asp Val Phe Lys Glu Asn Tyr Val
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Thr Leu Pro Gly Thr Phe Asp Glu Cys Tyr Pro Thr Tyr Leu Tyr Gln
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Lys Ile Asp Glu Ser Lys Leu Lys Ala Tyr Thr Arg Tyr Gln Leu Arg
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Gly Tyr Ile Glu Asp Ser Gln Asp Leu Glu Ile Tyr Leu Ile Arg Tyr
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Asn Ala Lys His Glu Ile Val Asn Val Pro Gly Thr Gly Ser Leu Trp
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Pro Leu Ser Val Glu Asn Gln Ile Gly Pro Cys Gly Glu Pro Asn Arg
            770   775   780

Cys Ala Pro His Leu Glu Trp Asn Pro Asp Leu His Cys Ser Cys Arg
785   790   795   800

Asp Gly Glu Lys Cys Ala His His Ser His His Phe Ser Leu Asp Ile
            805   810   815

Asp Val Gly Cys Thr Asp Leu Asn Glu Asp Leu Gly Val Trp Val Ile
            820   825   830

Phe Lys Ile Lys Thr Gln Asp Gly His Ala Arg Leu Gly Asn Leu Glu
            835   840   845

Phe Leu Glu Glu Lys Pro Leu Leu Gly Glu Ala Leu Ala Arg Val Lys
            850   855   860

Arg Ala Glu Lys Lys Trp Arg Asp Lys Arg Glu Thr Leu Gln Leu Glu
865   870   875   880

Thr Thr Ile Val Tyr Lys Glu Ala Lys Glu Ser Val Asp Ala Leu Phe
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Val Asn Ser Gln Tyr Asp Arg Leu Gln Ala Asp Thr Asn Ile Ala Met
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Ile His Ala Ala Asp Lys Arg Val His Arg Ile Arg Glu Ala Tyr Leu
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Pro Glu Leu Ser Val Ile Pro Gly Val Asn Ala Ala Ile Phe Glu Glu
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Leu Glu Glu Arg Ile Phe Thr Ala Phe Ser Leu Tyr Asp Ala Arg Asn
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Ile Ile Lys Asn Gly Asp Phe Asn Asn Gly Leu Leu Cys Trp Asn Val
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Lys Gly His Val Glu Val Glu Glu Gln Asn Asn His Arg Ser Val Leu
            980   985   990

Val Ile Pro Glu Trp Glu Ala Glu Val Ser Gln Glu Val Arg Val Cys
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Pro Gly Arg Gly Tyr Ile Leu Arg Val Thr Ala Tyr Lys Glu Gly Tyr
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Gly Glu Gly Cys Val Thr Ile His Glu Ile Glu Asn Asn Thr Asp Glu
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Leu Lys Phe Asn Asn Cys Val Glu Glu Glu Val Tyr Pro Asn Asn Thr
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Val Thr Cys Ile Asn Tyr Thr Ala Thr Gln Glu Glu Tyr Glu Gly Thr
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Tyr Thr Ser Arg Asn Arg Gly Tyr Asp Glu Ala Tyr Gly Asn Asn Pro
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Ser Val Pro Ala Asp Tyr Ala Ser Val Tyr Glu Glu Lys Ser Tyr Thr
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Asp Arg Arg Arg Glu Asn Pro Cys Glu Ser Asn Arg Gly Tyr Gly Asp
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Tyr Thr Pro Leu Pro Ala Gly Tyr Val Thr Lys Glu Leu Glu Tyr Phe
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gag gaa aat aat caa aat caa tgc ata cct tac aat tgt tta agt aat        284
Glu Glu Asn Asn Gln Asn Gln Cys Ile Pro Tyr Asn Cys Leu Ser Asn
                 5                  10                  15

cct gaa gaa gta ctt ttg gat gga gaa cgg ata tca act ggt aat tca        332
Pro Glu Glu Val Leu Leu Asp Gly Glu Arg Ile Ser Thr Gly Asn Ser
                20                  25                  30

tca att gat att tct ctg tca ctt gtt cag ttt atg gta tct aac ttt        380
Ser Ile Asp Ile Ser Leu Ser Leu Val Gln Phe Met Val Ser Asn Phe
         35                  40                  45

gta cca ggg gga gga ttt tta gtt gga tta ata gat ttt gta tgg gga        428
Val Pro Gly Gly Gly Phe Leu Val Gly Leu Ile Asp Phe Val Trp Gly
 50                  55                  60                  65

ata gtt ggc cct tct caa tgg gat gca ttt cta gta caa att gaa caa        476
Ile Val Gly Pro Ser Gln Trp Asp Ala Phe Leu Val Gln Ile Glu Gln
                     70                  75                  80

tta att aat gaa aga ata gct gaa ttt gct agg aat gct gct att gct        524
Leu Ile Asn Glu Arg Ile Ala Glu Phe Ala Arg Asn Ala Ala Ile Ala
                 85                  90                  95

aat tta gaa gga tta gaa aac aat tta aat ata tat gtg gaa gca ttt        572
Asn Leu Glu Gly Leu Glu Asn Asn Leu Asn Ile Tyr Val Glu Ala Phe
                100                 105                 110

aaa gaa tgg gaa gaa gat cct aat aat cca gaa acc agg acc aga gta        620
Lys Glu Trp Glu Glu Asp Pro Asn Asn Pro Glu Thr Arg Thr Arg Val
                115                 120                 125

att gat cgc ttt cgt ata ctt gat ggg cta ctt gaa agg gac att cct        668
Ile Asp Arg Phe Arg Ile Leu Asp Gly Leu Leu Glu Arg Asp Ile Pro
130                 135                 140                 145

tcg ttt cga att tct gga ttt gaa gta ccc ctt tta tcc gtt tat gct        716
Ser Phe Arg Ile Ser Gly Phe Glu Val Pro Leu Leu Ser Val Tyr Ala
                     150                 155                 160

caa gcg gcc aat ctg cat cta gct ata tta aga gat tct gta att ttt        754
Gln Ala Ala Asn Leu His Leu Ala Ile Leu Arg Asp Ser Val Ile Phe
                 165                 170                 175

gga gaa aga tgg gga ttg aca acg ata aat gtc aat gaa aac tat aat        812
Gly Glu Arg Trp Gly Leu Thr Thr Ile Asn Val Asn Glu Asn Tyr Asn
                180                 185                 190

aga cta att agg cat att gat gaa tat gct gat cac tgt gca aat acg        860
Arg Leu Ile Arg His Ile Asp Glu Tyr Ala Asp His Cys Ala Asn Thr
         195                 200                 205
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tat aat cgg gga tta aat aat tta ccg aaa tct acg tat caa gat tgg      908
Tyr Asn Arg Gly Leu Asn Asn Leu Pro Lys Ser Thr Tyr Gln Asp Trp
210             215             220             225

ata aca tat aat cga tta cgg aga gac tta aca ttg act gta tta gat      956
Ile Thr Tyr Asn Arg Leu Arg Arg Asp Leu Thr Leu Thr Val Leu Asp
            230             235             240

atc gcc gct ttc ttt cca aac tat gac aat agg aga tat cca att cag     1004
Ile Ala Ala Phe Phe Pro Asn Tyr Asp Asn Arg Arg Tyr Pro Ile Gln
            245             250             255

cca gtt ggt caa cta aca agg gaa gtt tat acg gac cca tta att aat     1052
Pro Val Gly Gln Leu Thr Arg Glu Val Tyr Thr Asp Pro Leu Ile Asn
            260             265             270

ttt aat cca cag tta cag tct gta gct caa tta cct act ttt aac gtt     1100
Phe Asn Pro Gln Leu Gln Ser Val Ala Gln Leu Pro Thr Phe Asn Val
        275             280             285

atg gag agc agc gca att aga aat cct cat tta ttt gat ata ttg aat     1148
Met Glu Ser Ser Ala Ile Arg Asn Pro His Leu Phe Asp Ile Leu Asn
290             295             300             305

aat ctt aca atc ttt acg gat tgg ttt agt gtt gga cgc aat ttt tat     1196
Asn Leu Thr Ile Phe Thr Asp Trp Phe Ser Val Gly Arg Asn Phe Tyr
                310             315             320

tgg gga gga cat cga gta ata tct agc ctt ata gga ggt ggt aac ata     1244
Trp Gly Gly His Arg Val Ile Ser Ser Leu Ile Gly Gly Gly Asn Ile
                325             330             335

aca tct cct ata tat gga aga gag gcg aac cag gag cct cca aga tcc     1292
Thr Ser Pro Ile Tyr Gly Arg Glu Ala Asn Gln Glu Pro Pro Arg Ser
        340             345             350

ttt act ttt aat gga ccg gta ttt agg act tta tca aat cct act tta     1340
Phe Thr Phe Asn Gly Pro Val Phe Arg Thr Leu Ser Asn Pro Thr Leu
        355             360             365

cga tta tta cag caa cct tgg cca gcg cca cca ttt aat tta cgt ggt     1388
Arg Leu Leu Gln Gln Pro Trp Pro Ala Pro Pro Phe Asn Leu Arg Gly
370             375             380             385

gtt gaa gga gta gaa ttt tct aca cct aca aat agc ttt acg tat cga     1436
Val Glu Gly Val Glu Phe Ser Thr Pro Thr Asn Ser Phe Thr Tyr Arg
                390             395             400

gga aga ggt acg gtt gat tct tta act gaa tta ccg cct gag gat aat     1484
Gly Arg Gly Thr Val Asp Ser Leu Thr Glu Leu Pro Pro Glu Asp Asn
            405             410             415
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agt gtg cca cct cgc gaa gga tat agt cat cgt tta tgt cat gca act       1532
Ser Val Pro Pro Arg Glu Gly Tyr Ser His Arg Leu Cys His Ala Thr
        420             425             430

ttt gtt caa aga tct gga aca cct ttt tta aca act ggt gta gta ttt       1580
Phe Val Gln Arg Ser Gly Thr Pro Phe Leu Thr Thr Gly Val Val Phe
        435             440             445

tct tgg acg cat cgt agt gca act ctt aca aat aca att gat cca gag       1628
Ser Trp Thr His Arg Ser Ala Thr Leu Thr Asn Thr Ile Asp Pro Glu
450             455             460             465

aga att aat caa ata cct tta gtg aaa gga ttt aga gtt tgg ggg ggc       1676
Arg Ile Asn Gln Ile Pro Leu Val Lys Gly Phe Arg Val Trp Gly Gly
            470             475             480

acc tct gtc att aca gga cca gga ttt aca gga ggg gat atc ctt cga       1724
Thr Ser Val Ile Thr Gly Pro Gly Phe Thr Gly Gly Asp Ile Leu Arg
            485             490             495

aga aat acc ttt ggt gat ttt gta tct cta caa gtc aat att aat tca       1772
Arg Asn Thr Phe Gly Asp Phe Val Ser Leu Gln Val Asn Ile Asn Ser
        500             505             510

cca att acc caa aga tac cgt tta aga ttt cgt tac gct tcc agt agg       1820
Pro Ile Thr Gln Arg Tyr Arg Leu Arg Phe Arg Tyr Ala Ser Ser Arg
        515             520             525

gat gca cga gtt ata gta tta aca gga gcg gca tcc aca gga gtg gga       1868
Asp Ala Arg Val Ile Val Leu Thr Gly Ala Ala Ser Thr Gly Val Gly
530             535             540             545

ggc caa gtt agt gta aat atg cct ctt cag aaa act atg gaa ata ggg       1916
Gly Gln Val Ser Val Asn Met Pro Leu Gln Lys Thr Met Glu Ile Gly
            550             555             560

gag aac tta aca tct aga aca ttt aga tat acc gat ttt agt aat cct       1964
Glu Asn Leu Thr Ser Arg Thr Phe Arg Tyr Thr Asp Phe Ser Asn Pro
            565             570             575

ttt tca ttt aga gct aat cca gat ata att ggg ata agt gaa caa cct       2012
Phe Ser Phe Arg Ala Asn Pro Asp Ile Ile Gly Ile Ser Glu Gln Pro
            580             585             590

cta ttt ggt gca ggt tct att agt agc ggt gaa ctt tat ata gat aaa       2060
Leu Phe Gly Ala Gly Ser Ile Ser Ser Gly Glu Leu Tyr Ile Asp Lys
        595             600             605

att gaa att att cta gca gat gca aca ttt gaa gca gaa tct gat tta       2108
Ile Glu Ile Ile Leu Ala Asp Ala Thr Phe Glu Ala Glu Ser Asp Leu
610             615             620             625
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gaa aga gca caa aag gcg gtg aat gcc ctg ttt act tct tcc aat caa    2156
Glu Arg Ala Gln Lys Ala Val Asn Ala Leu Phe Thr Ser Ser Asn Gln
            630             635             640

atc ggg tta aaa acc gat gtg acg gat tat cat att gat caa gta tcc    2204
Ile Gly Leu Lys Thr Asp Val Thr Asp Tyr His Ile Asp Gln Val Ser
            645             650             655

aat tta gtg gat tgt tta tca gat gaa ttt tgt ctg gat gaa aag cga    2252
Asn Leu Val Asp Cys Leu Ser Asp Glu Phe Cys Leu Asp Glu Lys Arg
            660             665             670

gaa ttg tcc gag aaa gtc aaa cat gcg aag cga ctc agt gat gag cgg    2300
Glu Leu Ser Glu Lys Val Lys His Ala Lys Arg Leu Ser Asp Glu Arg
            675             680             685

aat tta ctt caa gat cca aac ttc aga ggg atc aat aga caa cca gac    2348
Asn Leu Leu Gln Asp Pro Asn Phe Arg Gly Ile Asn Arg Gln Pro Asp
690             695             700             705

cgt ggc tgg aga gga agt aca gat att acc atc caa gga gga gat gac    2396
Arg Gly Trp Arg Gly Ser Thr Asp Ile Thr Ile Gln Gly Gly Asp Asp
                710             715             720

gta ttc aaa gag aat tac gtc aca cta ccg ggt acc gtt gat gag tgc    2444
Val Phe Lys Glu Asn Tyr Val Thr Leu Pro Gly Thr Val Asp Glu Cys
            725             730             735

tat cca acg tat tta tat cag aaa ata gat gag tcg aaa tta aaa gct    2492
Tyr Pro Thr Tyr Leu Tyr Gln Lys Ile Asp Glu Ser Lys Leu Lys Ala
            740             745             750

tat acc cgt tat gaa tta aga ggg tat atc gaa gat agt caa gac tta    2540
Tyr Thr Arg Tyr Glu Leu Arg Gly Tyr Ile Glu Asp Ser Gln Asp Leu
            755             760             765

gaa atc tat ttg atc cgt tac aat gca aaa cac gaa ata gta aat gtg    2588
Glu Ile Tyr Leu Ile Arg Tyr Asn Ala Lys His Glu Ile Val Asn Val
770             775             780             785

cca ggc acg ggt tcc tta tgg ccg ctt tca gcc caa agt cca atc gga    2636
Pro Gly Thr Gly Ser Leu Trp Pro Leu Ser Ala Gln Ser Pro Ile Gly
                790             795             800

aag tgt gga gaa ccg aat cga tgc gcg cca cac ctt gaa tgg aat cct    2684
Lys Cys Gly Glu Pro Asn Arg Cys Ala Pro His Leu Glu Trp Asn Pro
            805             810             815

gat cta gat tgt tcc tgc aga gac ggg gaa aaa tgt gca cat cat tcc    2732
Asp Leu Asp Cys Ser Cys Arg Asp Gly Glu Lys Cys Ala His His Ser
            820             825             830
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cat cat ttc acc ttg gat att gat gtt gga tgt aca gac tta aat gag    2780
His His Phe Thr Leu Asp Ile Asp Val Gly Cys Thr Asp Leu Asn Glu
    835                 840                 845

gac tta ggt gta tgg gtg ata ttc aag att aag acg caa gat ggc cat    2828
Asp Leu Gly Val Trp Val Ile Phe Lys Ile Lys Thr Gln Asp Gly His
850                 855                 860                 865

gca aga cta ggg aat cta gag ttt ctc gaa gag aaa cca tta tta ggg    2876
Ala Arg Leu Gly Asn Leu Glu Phe Leu Glu Glu Lys Pro Leu Leu Gly
                    870                 875                 880

gaa gca cta gct cgt gtg aaa aga gcg gag aag aag tgg aga gac aaa    2924
Glu Ala Leu Ala Arg Val Lys Arg Ala Glu Lys Lys Trp Arg Asp Lys
                885                 890                 895

cga gag aaa ctg cag ttg gaa aca aat att gtt tat aaa gag gca aaa    2972
Arg Glu Lys Leu Gln Leu Glu Thr Asn Ile Val Tyr Lys Glu Ala Lys
            900                 905                 910

gaa tct gta gat gct tta ttt gta aac tct caa tat gat aga tta caa    3020
Glu Ser Val Asp Ala Leu Phe Val Asn Ser Gln Tyr Asp Arg Leu Gln
        915                 920                 925

gtg gat acg aac atc gcg atg att cat gcg gca gat aaa cgc gtt cat    3068
Val Asp Thr Asn Ile Ala Met Ile His Ala Ala Asp Lys Arg Val His
930                 935                 940                 945

aga atc cgg gaa gcg tat ctg cca gag ttg tct gtg att cca ggt gtc    3116
Arg Ile Arg Glu Ala Tyr Leu Pro Glu Leu Ser Val Ile Pro Gly Val
                    950                 955                 960

aat gcg gcc att ttc gaa gaa tta gag gga cgt att ttt aca gcg tat    3164
Asn Ala Ala Ile Phe Glu Glu Leu Glu Gly Arg Ile Phe Thr Ala Tyr
                965                 970                 975

tcc tta tat gat gcg aga aat gtc att aaa aat ggc gat ttc aat aat    3212
Ser Leu Tyr Asp Ala Arg Asn Val Ile Lys Asn Gly Asp Phe Asn Asn
            980                 985                 990

ggc tta tta tgc tgg aac gtg aaa ggt cat gta gat gta gaa gag caa    3260
Gly Leu Leu Cys Trp Asn Val Lys Gly His Val Asp Val Glu Glu Gln
    995                 1000                1005

aac aac cac cgt tcg gtc ctt gtt atc cca gaa tgg gag gca gaa gtg    3308
Asn Asn His Arg Ser Val Leu Val Ile Pro Glu Trp Glu Ala Glu Val
1010                1015                1020                1025

tca caa gag gtt cgt gtc tgt cca ggt cgt ggc tat atc ctt cgt gtc    3356
Ser Gln Glu Val Arg Val Cys Pro Gly Arg Gly Tyr Ile Leu Arg Val
                    1030                1035                1040
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aca gca tat aaa gag gga tat gga gag ggc tgc gta acg atc cat gag       3404
Thr Ala Tyr Lys Glu Gly Tyr Gly Glu Gly Cys Val Thr Ile His Glu
         1045                1050                1055

atc gaa gac aat aca gac gaa ctg aaa ttc agc aac tgt gta gaa gag       3452
Ile Glu Asp Asn Thr Asp Glu Leu Lys Phe Ser Asn Cys Val Glu Glu
         1060                1065                1070

gaa gta tat cca aac aac aca gta acg tgt aat aat tat act ggg act       3500
Glu Val Tyr Pro Asn Asn Thr Val Thr Cys Asn Asn Tyr Thr Gly Thr
      1075                1080                1085

caa gaa gaa tat gag ggt acg tac act tct cgt aat caa gga tat gac       3548
Gln Glu Glu Tyr Glu Gly Thr Tyr Thr Ser Arg Asn Gln Gly Tyr Asp
1090                1095                1100                1105

gaa gcc tat ggt aat aac cct tcc gta cca gct gat tac gct tca gtc       3596
Glu Ala Tyr Gly Asn Asn Pro Ser Val Pro Ala Asp Tyr Ala Ser Val
               1110                1115                1120

tat gaa gaa aaa tcg tat aca gat gga cga aga gag aat cct tgt gaa       3644
Tyr Glu Glu Lys Ser Tyr Thr Asp Gly Arg Arg Glu Asn Pro Cys Glu
               1125                1130                1135

tct aac aga ggc tat ggg gat tac aca cca cta ccg gct ggt tat gta       3692
Ser Asn Arg Gly Tyr Gly Asp Tyr Thr Pro Leu Pro Ala Gly Tyr Val
         1140                1145                1150

aca aag gat tta gag tac ttc cca gag acc gat aag gta tgg att gag       3740
Thr Lys Asp Leu Glu Tyr Phe Pro Glu Thr Asp Lys Val Trp Ile Glu
         1155                1160                1165

atc gga gaa aca gaa gga aca ttc atc gtg gat agc gtg gaa tta ctc       3788
Ile Gly Glu Thr Glu Gly Thr Phe Ile Val Asp Ser Val Glu Leu Leu
1170                1175                1180                1185

ctt atg gag gaa taa gatacgttat aaaatgtaac gtatgcaaat aaagaatgat      3843
Leu Met Glu Glu
            1190

tactgaccta tattaacaga taaataagaa aatttttata cgaataaaaa acggacatca 3903
ctcttaagag aatgatgtcc                                                3923


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Asn Pro Glu Glu Val Leu Leu Asp Gly Glu Arg Ile Ser Thr Gly Asn
            20                  25                  30

Ser Ser Ile Asp Ile Ser Leu Ser Leu Val Gln Phe Met Val Ser Asn
            35                  40                  45

Phe Val Pro Gly Gly Gly Phe Leu Val Gly Leu Ile Asp Phe Val Trp
        50                  55                  60

Gly Ile Val Gly Pro Ser Gln Trp Asp Ala Phe Leu Val Gln Ile Glu
65                  70                  75                  80

Gln Leu Ile Asn Glu Arg Ile Ala Glu Phe Ala Arg Asn Ala Ala Ile
                85                  90                  95

Ala Asn Leu Glu Gly Leu Glu Asn Asn Leu Asn Ile Tyr Val Glu Ala
            100                 105                 110

Phe Lys Glu Trp Glu Glu Asp Pro Asn Asn Pro Glu Thr Arg Thr Arg
            115                 120                 125

Val Ile Asp Arg Phe Arg Ile Leu Asp Gly Leu Leu Glu Arg Asp Ile
            130                 135                 140

Pro Ser Phe Arg Ile Ser Gly Phe Glu Val Pro Leu Leu Ser Val Tyr
145                 150                 155                 160

Ala Gln Ala Ala Asn Leu His Leu Ala Ile Leu Arg Asp Ser Val Ile
                165                 170                 175

Phe Gly Glu Arg Trp Gly Leu Thr Thr Ile Asn Val Asn Glu Asn Tyr
            180                 185                 190

Asn Arg Leu Ile Arg His Ile Asp Glu Tyr Ala Asp His Cys Ala Asn
            195                 200                 205

Thr Tyr Asn Arg Gly Leu Asn Asn Leu Pro Lys Ser Thr Tyr Gln Asp
210                 215                 220

Trp Ile Thr Tyr Asn Arg Leu Arg Arg Asp Leu Thr Leu Thr Val Leu
225                 230                 235                 240

Asp Ile Ala Ala Phe Phe Pro Asn Tyr Asp Asn Arg Arg Tyr Pro Ile
                245                 250                 255

Gln Pro Val Gly Gln Leu Thr Arg Glu Val Tyr Thr Asp Pro Leu Ile
            260                 265                 270
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Asn Phe Asn Pro Gln Leu Gln Ser Val Ala Gln Leu Pro Thr Phe Asn
        275                 280                 285

Val Met Glu Ser Ser Ala Ile Arg Asn Pro His Leu Phe Asp Ile Leu
        290                 295                 300

Asn Asn Leu Thr Ile Phe Thr Asp Trp Phe Ser Val Gly Arg Asn Phe
305                 310                 315                 320

Tyr Trp Gly Gly His Arg Val Ile Ser Ser Leu Ile Gly Gly Gly Asn
                325                 330                 335

Ile Thr Ser Pro Ile Tyr Gly Arg Glu Ala Asn Gln Glu Pro Pro Arg
                340                 345                 350

Ser Phe Thr Phe Asn Gly Pro Val Phe Arg Thr Leu Ser Asn Pro Thr
                355                 360                 365

Leu Arg Leu Leu Gln Gln Pro Trp Pro Ala Pro Pro Phe Asn Leu Arg
        370                 375                 380

Gly Val Glu Gly Val Glu Phe Ser Thr Pro Thr Asn Ser Phe Thr Tyr
385                 390                 395                 400

Arg Gly Arg Gly Thr Val Asp Ser Leu Thr Glu Leu Pro Pro Glu Asp
                405                 410                 415

Asn Ser Val Pro Pro Arg Glu Gly Tyr Ser His Arg Leu Cys His Ala
                420                 425                 430

Thr Phe Val Gln Arg Ser Gly Thr Pro Phe Leu Thr Thr Gly Val Val
        435                 440                 445

Phe Ser Trp Thr His Arg Ser Ala Thr Leu Thr Asn Thr Ile Asp Pro
        450                 455                 460

Glu Arg Ile Asn Gln Ile Pro Leu Val Lys Gly Phe Arg Val Trp Gly
465                 470                 475                 480

Gly Thr Ser Val Ile Thr Gly Pro Gly Phe Thr Gly Gly Asp Ile Leu
                485                 490                 495

Arg Arg Asn Thr Phe Gly Asp Phe Val Ser Leu Gln Val Asn Ile Asn
                500                 505                 510

Ser Pro Ile Thr Gln Arg Tyr Arg Leu Arg Phe Arg Tyr Ala Ser Ser
                515                 520                 525

Arg Asp Ala Arg Val Ile Val Leu Thr Gly Ala Ala Ser Thr Gly Val
        530                 535                 540
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Gly Gly Gln Val Ser Val Asn Met Pro Leu Gln Lys Thr Met Glu Ile
545             550             555             560

Gly Glu Asn Leu Thr Ser Arg Thr Phe Arg Tyr Thr Asp Phe Ser Asn
                565             570             575

Pro Phe Ser Phe Arg Ala Asn Pro Asp Ile Ile Gly Ile Ser Glu Gln
                580             585             590

Pro Leu Phe Gly Ala Gly Ser Ile Ser Ser Gly Glu Leu Tyr Ile Asp
            595             600             605

Lys Ile Glu Ile Ile Leu Ala Asp Ala Thr Phe Glu Ala Glu Ser Asp
        610             615             620

Leu Glu Arg Ala Gln Lys Ala Val Asn Ala Leu Phe Thr Ser Ser Asn
625             630             635             640

Gln Ile Gly Leu Lys Thr Asp Val Thr Asp Tyr His Ile Asp Gln Val
                645             650             655

Ser Asn Leu Val Asp Cys Leu Ser Asp Glu Phe Cys Leu Asp Glu Lys
            660             665             670

Arg Glu Leu Ser Glu Lys Val Lys His Ala Lys Arg Leu Ser Asp Glu
            675             680             685

Arg Asn Leu Leu Gln Asp Pro Asn Phe Arg Gly Ile Asn Arg Gln Pro
        690             695             700

Asp Arg Gly Trp Arg Gly Ser Thr Asp Ile Thr Ile Gln Gly Gly Asp
705             710             715             720

Asp Val Phe Lys Glu Asn Tyr Val Thr Leu Pro Gly Thr Val Asp Glu
                725             730             735

Cys Tyr Pro Thr Tyr Leu Tyr Gln Lys Ile Asp Glu Ser Lys Leu Lys
                740             745             750

Ala Tyr Thr Arg Tyr Glu Leu Arg Gly Tyr Ile Glu Asp Ser Gln Asp
            755             760             765

Leu Glu Ile Tyr Leu Ile Arg Tyr Asn Ala Lys His Glu Ile Val Asn
        770             775             780

Val Pro Gly Thr Gly Ser Leu Trp Pro Leu Ser Ala Gln Ser Pro Ile
785             790             795             800

Gly Lys Cys Gly Glu Pro Asn Arg Cys Ala Pro His Leu Glu Trp Asn
                805             810             815
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Pro Asp Leu Asp Cys Ser Cys Arg Asp Gly Glu Lys Cys Ala His His
        820   825   830

Ser His His Phe Thr Leu Asp Ile Asp Val Gly Cys Thr Asp Leu Asn
        835   840   845

Glu Asp Leu Gly Val Trp Val Ile Phe Lys Ile Lys Thr Gln Asp Gly
        850   855   860

His Ala Arg Leu Gly Asn Leu Glu Phe Leu Glu Glu Lys Pro Leu Leu
865   870   875   880

Gly Glu Ala Leu Ala Arg Val Lys Arg Ala Glu Lys Lys Trp Arg Asp
                385   890   895

Lys Arg Glu Lys Leu Gln Leu Glu Thr Asn Ile Val Tyr Lys Glu Ala
                900   905   910

Lys Glu Ser Val Asp Ala Leu Phe Val Asn Ser Gln Tyr Asp Arg Leu
                915   920   925

Gln Val Asp Thr Asn Ile Ala Met Ile His Ala Ala Asp Lys Arg Val
        930   935   940

His Arg Ile Arg Glu Ala Tyr Leu Pro Glu Leu Ser Val Ile Pro Gly
945   950   955   960

Val Asn Ala Ala Ile Phe Glu Glu Leu Glu Gly Arg Ile Phe Thr Ala
                965   970   975

Tyr Ser Leu Tyr Asp Ala Arg Asn Val Ile Lys Asn Gly Asp Phe Asn
                980   985   990

Asn Gly Leu Leu Cys Trp Asn Val Lys Gly His Val Asp Val Glu Glu
                995   1000   1005

Gln Asn Asn His Arg Ser Val Leu Val Ile Pro Glu Trp Glu Ala Glu
        1010   1015   1020

Val Ser Gln Glu Val Arg Val Cys Pro Gly Arg Gly Tyr Ile Leu Arg
025   1030   1035   1040

Val Thr Ala Tyr Lys Glu Gly Tyr Gly Glu Gly Cys Val Thr Ile His
                1045   1050   1055

Glu Ile Glu Asp Asn Thr Asp Glu Leu Lys Phe Ser Asn Cys Val Glu
                1060   1065   1070

Glu Glu Val Tyr Pro Asn Asn Thr Val Thr Cys Asn Asn Tyr Thr Gly
        1075   1080   1085

Thr Gln Glu Glu Tyr Glu Gly Thr Tyr Thr Ser Arg Asn Gln Gly Tyr
  1090   1095   1100

Asp Glu Ala Tyr Gly Asn Asn Pro Ser Val Pro Ala Asp Tyr Ala Ser
105   1110   1115   1120

Val Tyr Glu Glu Lys Ser Tyr Thr Asp Gly Arg Arg Glu Asn Pro Cys
      1125   1130   1135

Glu Ser Asn Arg Gly Tyr Gly Asp Tyr Thr Pro Leu Pro Ala Gly Tyr
      1140   1145   1150

Val Thr Lys Asp Leu Glu Tyr Phe Pro Glu Thr Asp Lys Val Trp Ile
    1155   1160   1165

Glu Ile Gly Glu Thr Glu Gly Thr Phe Ile Val Asp Ser Val Glu Leu
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Leu Leu Met Glu Glu
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Leu Thr Ser Asn Arg Lys Asn Glu Asn Glu Ile Ile Asn Ala Val Ser
1   5   10   15

aat cat tcc gca caa atg gat cta tta cca gat gct cgt att gag gat   96
Asn His Ser Ala Gln Met Asp Leu Leu Pro Asp Ala Arg Ile Glu Asp
      20   25   30

agc ttg tgt ata gcc gag ggg aac aat att gat cca ttt gtt agc gca   144
Ser Leu Cys Ile Ala Glu Gly Asn Asn Ile Asp Pro Phe Val Ser Ala
        35   40   45

tca aca gtc caa acg ggt att aac ata gct ggt aga ata cta ggc gta   192
Ser Thr Val Gln Thr Gly Ile Asn Ile Ala Gly Arg Ile Leu Gly Val
    50   55   60

ttg ggc gta ccg ttt gct gga caa cta gct agt ttt tat agt ttt ctt   240
Leu Gly Val Pro Phe Ala Gly Gln Leu Ala Ser Phe Tyr Ser Phe Leu
65   70   75   80

gtt ggt gaa tta tgg ccc cgc ggc aga gat cag tgg gaa att ttc cta   288

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Val Gly Glu Leu Trp Pro Arg Gly Arg Asp Gln Trp Glu Ile Phe Leu
              85                  90                  95

gaa cat gtc gaa caa ctt ata aat caa caa ata aca gaa aat gct agg      336
Glu His Val Glu Gln Leu Ile Asn Gln Gln Ile Thr Glu Asn Ala Arg
             100                 105                 110

aat acg gct ctt gct cga tta caa ggt tta gga gat tcc ttc aga gcc      384
Asn Thr Ala Leu Ala Arg Leu Gln Gly Leu Gly Asp Ser Phe Arg Ala
             115                 120                 125

tat caa cag tca ctt gaa gat tgg cta gaa aac cgt gat gat gca aga      432
Tyr Gln Gln Ser Leu Glu Asp Trp Leu Glu Asn Arg Asp Asp Ala Arg
         130                 135                 140

acg aga agt gtt ctt cat acc caa tat ata gct tta gaa ctt gat ttt      480
Thr Arg Ser Val Leu His Thr Gln Tyr Ile Ala Leu Glu Leu Asp Phe
145                 150                 155                 160

ctt aat gcg atg ccg ctt ttc gca att aga aac caa gaa gtt cca tta      528
Leu Asn Ala Met Pro Leu Phe Ala Ile Arg Asn Gln Glu Val Pro Leu
                 165                 170                 175

ttg atg gta tat gct caa gct gca aat tta cac cta tta tta ttg aga      576
Leu Met Val Tyr Ala Gln Ala Ala Asn Leu His Leu Leu Leu Leu Arg
             180                 185                 190

gat gcc tct ctt ttt ggt agt gaa ttt ggg ctt aca tcg cag gaa att      624
Asp Ala Ser Leu Phe Gly Ser Glu Phe Gly Leu Thr Ser Gln Glu Ile
             195                 200                 205

caa cgc tat tat gag cgc caa gtg gaa cga acg aga gat tat tcc gac      672
Gln Arg Tyr Tyr Glu Arg Gln Val Glu Arg Thr Arg Asp Tyr Ser Asp
         210                 215                 220

tat tgc gta gaa tgg tat aat aca ggt cta aat agc ttg aga ggg aca      720
Tyr Cys Val Glu Trp Tyr Asn Thr Gly Leu Asn Ser Leu Arg Gly Thr
225                 230                 235                 240

aat gcc gca agt tgg gta cgg tat aat caa ttc cgt aga gat cta acg      768
Asn Ala Ala Ser Trp Val Arg Tyr Asn Gln Phe Arg Arg Asp Leu Thr
                 245                 250                 255

tta gga gta tta gat cta gtg gca cta ttc cca agc tat gac act cgc      816
Leu Gly Val Leu Asp Leu Val Ala Leu Phe Pro Ser Tyr Asp Thr Arg
             260                 265                 270

act tat cca ata aat acg agt gct cag tta aca aga gaa gtt tat aca      864
Thr Tyr Pro Ile Asn Thr Ser Ala Gln Leu Thr Arg Glu Val Tyr Thr
             275                 280                 285

gac gca att gga gca aca ggg gta aat atg gca agt atg aat tgg tat      912
Asp Ala Ile Gly Ala Thr Gly Val Asn Met Ala Ser Met Asn Trp Tyr
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aat aat aat gca cct tcg ttc tct gcc ata gag gct gcg gct atc cga     960
Asn Asn Asn Ala Pro Ser Phe Ser Ala Ile Glu Ala Ala Ala Ile Arg
305             310             315             320

agc ccg cat cta ctt gat ttt cta gaa caa ctt aca att ttt agc gct    1008
Ser Pro His Leu Leu Asp Phe Leu Glu Gln Leu Thr Ile Phe Ser Ala
                325             330             335

tca tca cga tgg agt aat act agg cat atg act tat tgg cgg ggg cac    1056
Ser Ser Arg Trp Ser Asn Thr Arg His Met Thr Tyr Trp Arg Gly His
            340             345             350

acg att caa tct cgg cca ata gga ggc gga tta aat acc tca acg cat    1104
Thr Ile Gln Ser Arg Pro Ile Gly Gly Gly Leu Asn Thr Ser Thr His
            355             360             365

ggg gct acc aat act tct att aat cct gta aca tta cgg ttc gca tct    1152
Gly Ala Thr Asn Thr Ser Ile Asn Pro Val Thr Leu Arg Phe Ala Ser
        370             375             380

cga gac gtt tat agg act gaa tca tat gca gga gtg ctt cta tgg gga    1200
Arg Asp Val Tyr Arg Thr Glu Ser Tyr Ala Gly Val Leu Leu Trp Gly
385             390             395             400

att tac ctt gaa cct att cat ggt gtc cct act gtt agg ttt aat ttt    1248
Ile Tyr Leu Glu Pro Ile His Gly Val Pro Thr Val Arg Phe Asn Phe
                405             410             415

acg aac cct cag aat att tct gat aga ggt acc gct aac tat agt caa    1296
Thr Asn Pro Gln Asn Ile Ser Asp Arg Gly Thr Ala Asn Tyr Ser Gln
                420             425             430

cct tat gag tca cct ggg ctt caa tta aaa gat tca gaa act gaa tta    1344
Pro Tyr Glu Ser Pro Gly Leu Gln Leu Lys Asp Ser Glu Thr Glu Leu
            435             440             445

cca cca gaa aca aca gaa cga cca aat tat gaa tct tac agt cac agg    1392
Pro Pro Glu Thr Thr Glu Arg Pro Asn Tyr Glu Ser Tyr Ser His Arg
        450             455             460

tta tct cat ata ggt ata att tta caa tcc agg gtg aat gta ccg gta    1440
Leu Ser His Ile Gly Ile Ile Leu Gln Ser Arg Val Asn Val Pro Val
465             470             475             480

tat tct tgg acg cat cgt agt gca gat cgt acg aat acg att gga cca    1488
Tyr Ser Trp Thr His Arg Ser Ala Asp Arg Thr Asn Thr Ile Gly Pro
            485             490             495

aat aga atc acc caa atc cca atg gta aaa gca tcc gaa ctt cct caa    1536
Asn Arg Ile Thr Gln Ile Pro Met Val Lys Ala Ser Glu Leu Pro Gln
            500             505             510
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ggt acc act gtt gtt aga gga cca gga ttt act ggt ggg gat att ctt        1584
Gly Thr Thr Val Val Arg Gly Pro Gly Phe Thr Gly Gly Asp Ile Leu
        515             520             525

cga aga acg aat act ggt gga ttt gga ccg ata aga gta act gtt aac        1632
Arg Arg Thr Asn Thr Gly Gly Phe Gly Pro Ile Arg Val Thr Val Asn
        530             535             540

gga cca tta aca caa aga tat cgt ata gga ttc cgc tat gct tca act        1680
Gly Pro Leu Thr Gln Arg Tyr Arg Ile Gly Phe Arg Tyr Ala Ser Thr
545             550             555             560

gta gat ttt gat ttc ttt gta tca cgt gga ggt act act gta aat aat        1728
Val Asp Phe Asp Phe Phe Val Ser Arg Gly Gly Thr Thr Val Asn Asn
                565             570             575

ttt aga ttc cta cgt aca atg aac agt gga gac gaa cta aaa tac gga        1776
Phe Arg Phe Leu Arg Thr Met Asn Ser Gly Asp Glu Leu Lys Tyr Gly
                580             585             590

aat ttt gtg aga cgt gct ttt act aca cct ttt act ttt aca caa att        1824
Asn Phe Val Arg Arg Ala Phe Thr Thr Pro Phe Thr Phe Thr Gln Ile
        595             600             605

caa gat ata att cga acg tct att caa ggc ctt agt gga aat ggg gaa        1872
Gln Asp Ile Ile Arg Thr Ser Ile Gln Gly Leu Ser Gly Asn Gly Glu
        610             615             620

gtg tat ata gat aaa att gaa att att cca gtt act gca acc ttc gaa        1920
Val Tyr Ile Asp Lys Ile Glu Ile Ile Pro Val Thr Ala Thr Phe Glu
625             630             635             640

gca gaa tat gat tta gaa aga gcg caa gag gcg gtg aat gct ctg ttt        1968
Ala Glu Tyr Asp Leu Glu Arg Ala Gln Glu Ala Val Asn Ala Leu Phe
                645             650             655

act aat acg aat cca aga aga ttg aaa aca gat gtg aca gat tat cat        2016
Thr Asn Thr Asn Pro Arg Arg Leu Lys Thr Asp Val Thr Asp Tyr His
                660             665             670

att gat caa gta tcc aat tta gtg gcg tgt tta tcg gat gaa ttc tgc        2064
Ile Asp Gln Val Ser Asn Leu Val Ala Cys Leu Ser Asp Glu Phe Cys
                675             680             685

ttg gat gaa aag aga gaa tta ctt gag aaa gtg aaa tat gcg aaa cga        2112
Leu Asp Glu Lys Arg Glu Leu Leu Glu Lys Val Lys Tyr Ala Lys Arg
        690             695             700

ctc agt gat gaa aga aac tta ctc caa gat cca aac ttc aca tcc atc        2160
Leu Ser Asp Glu Arg Asn Leu Leu Gln Asp Pro Asn Phe Thr Ser Ile
705             710             715             720

aat aag caa cca gac ttc ata tct act aat gag caa tcg aat ttc aca        2208
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Asn Lys Gln Pro Asp Phe Ile Ser Thr Asn Glu Gln Ser Asn Phe Thr
            725                 730                 735

tct atc cat gaa caa tct gaa cat gga tgg tgg gga agt gag aac att    2256
Ser Ile His Glu Gln Ser Glu His Gly Trp Trp Gly Ser Glu Asn Ile
            740                 745                 750

acc atc cag gaa gga aat gac gta ttt aaa gag aat tac gtc aca cta    2304
Thr Ile Gln Glu Gly Asn Asp Val Phe Lys Glu Asn Tyr Val Thr Leu
            755                 760                 765

ccg ggt act ttt aat gag tgt tat ccg acg tat tta tat caa aaa ata    2352
Pro Gly Thr Phe Asn Glu Cys Tyr Pro Thr Tyr Leu Tyr Gln Lys Ile
        770                 775                 780

ggg gag tcg gaa tta aaa gct tat act cgc tac caa tta aga ggt tat    2400
Gly Glu Ser Glu Leu Lys Ala Tyr Thr Arg Tyr Gln Leu Arg Gly Tyr
785                 790                 795                 800

att gaa gat agt caa gat tta gag ata tat ttg att cgt tat aat gcg    2448
Ile Glu Asp Ser Gln Asp Leu Glu Ile Tyr Leu Ile Arg Tyr Asn Ala
                805                 810                 815

aaa cat gaa aca ttg gat gtt cca ggt acc gag tcc cta tgg ccg ctt    2496
Lys His Glu Thr Leu Asp Val Pro Gly Thr Glu Ser Leu Trp Pro Leu
            820                 825                 830

tca gtt gaa agc cca atc gga agg tgc gga gaa ccg aat cga tgc gca    2544
Ser Val Glu Ser Pro Ile Gly Arg Cys Gly Glu Pro Asn Arg Cys Ala
            835                 840                 845

cca cat ttt gaa tgg aat cct gat cta gat tgt tcc tgc aga gat gga    2592
Pro His Phe Glu Trp Asn Pro Asp Leu Asp Cys Ser Cys Arg Asp Gly
        850                 855                 860

gaa aaa tgt gcg cat cat tcc cat cat ttc tct ttg gat att gat gtt    2640
Glu Lys Cys Ala His His Ser His His Phe Ser Leu Asp Ile Asp Val
865                 870                 875                 880

gga tgc aca gac ttg cat gag aat cta ggc gtg tgg gtg gta ttc aag    2688
Gly Cys Thr Asp Leu His Glu Asn Leu Gly Val Trp Val Val Phe Lys
                885                 890                 895

att aag acg cag gaa ggt cat gca aga cta ggg aat ctg gaa ttt att    2736
Ile Lys Thr Gln Glu Gly His Ala Arg Leu Gly Asn Leu Glu Phe Ile
            900                 905                 910

gaa gag aaa cca tta tta gga gaa gca ctg tct cgt gtg aag agg gca    2784
Glu Glu Lys Pro Leu Leu Gly Glu Ala Leu Ser Arg Val Lys Arg Ala
            915                 920                 925

gag aaa aaa tgg aga gac aaa cgt gaa aaa cta caa ttg gaa aca aaa    2832
Glu Lys Lys Trp Arg Asp Lys Arg Glu Lys Leu Gln Leu Glu Thr Lys
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cga gta tat aca gag gca aaa gaa gct gtg gat gct tta ttc gta gat      2880
Arg Val Tyr Thr Glu Ala Lys Glu Ala Val Asp Ala Leu Phe Val Asp
945                 950                 955                 960

tct caa tat gat aga tta caa gcg gat aca aac atc ggc atg att cat      2928
Ser Gln Tyr Asp Arg Leu Gln Ala Asp Thr Asn Ile Gly Met Ile His
                    965                 970                 975

gcg gca gat aaa ctt gtt cat cga att cga gag gcg tat ctt tca gaa      2976
Ala Ala Asp Lys Leu Val His Arg Ile Arg Glu Ala Tyr Leu Ser Glu
            980                 985                 990

tta cct gtt atc cca ggt gta aat  gcg gaa att ttt gaa  gaa tta gaa    3024
Leu Pro Val Ile Pro Gly Val Asn Ala Glu Ile Phe Glu Glu Leu Glu
            995                 1000                1005

ggt cac  att atc act gca atc  tcc tta tac gat gcg  aga aat gtc       3069
Gly His Ile Ile Thr Ala Ile Ser Leu Tyr Asp Ala Arg Asn Val
        1010                1015                1020

gtt aaa  aat ggt gat ttt aat  aat gga tta aca tgt  tgg aat gta       3114
Val Lys Asn Gly Asp Phe Asn Asn Gly Leu Thr Cys Trp Asn Val
        1025                1030                1035

aaa ggg  cat gta gat gta caa  cag agc cat cat cgt  tct gac ctt       3159
Lys Gly His Val Asp Val Gln Gln Ser His His Arg Ser Asp Leu
        1040                1045                1050

gtt atc  cca gaa tgg gaa gca  gaa gtg tca caa gca  gtt cgc gtc       3204
Val Ile Pro Glu Trp Glu Ala Glu Val Ser Gln Ala Val Arg Val
        1055                1060                1065

tgt ccg  ggg tgt ggc tat atc  ctt cgt gtc aca gcg  tac aaa gag       3249
Cys Pro Gly Cys Gly Tyr Ile Leu Arg Val Thr Ala Tyr Lys Glu
        1070                1075                1080

gga tat  gga gag ggc tgc gta  acg atc cat gaa atc  gag aac aat       3294
Gly Tyr Gly Glu Gly Cys Val Thr Ile His Glu Ile Glu Asn Asn
        1085                1090                1095

aca gac  gaa cta aaa ttt aaa  aac cgt gaa gaa gag  gaa gtg tat       3339
Thr Asp Glu Leu Lys Phe Lys Asn Arg Glu Glu Glu Glu Val Tyr
        1100                1105                1110

cca acg  gat aca gga acg tgt  aat gat tat act gca  cac caa ggt       3384
Pro Thr Asp Thr Gly Thr Cys Asn Asp Tyr Thr Ala His Gln Gly
        1115                1120                1125

aca gct  gga tgc gca gat gca  tgt aat tcc cgt aat  gct gga tat       3429
Thr Ala Gly Cys Ala Asp Ala Cys Asn Ser Arg Asn Ala Gly Tyr
        1130                1135                1140
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gag gat  gca tat gaa gtt gat  act aca gca tct gtt  aat tac aaa        3474
Glu Asp  Ala Tyr Glu Val Asp  Thr Thr Ala Ser Val  Asn Tyr Lys
    1145             1150             1155

ccg act  tat gaa gaa gaa acg  tat aca gat gta aga  aga gat aat        3519
Pro Thr  Tyr Glu Glu Glu Thr  Tyr Thr Asp Val Arg  Arg Asp Asn
    1160             1165             1170

cat tgt  gaa tat gac aga ggg  tat gtc aat tat cca  cca gta cca        3564
His Cys  Glu Tyr Asp Arg Gly  Tyr Val Asn Tyr Pro  Pro Val Pro
    1175             1180             1185

gct ggt  tat gtg aca aaa gaa  tta gaa tac ttc cca  gaa aca gat        3609
Ala Gly  Tyr Val Thr Lys Glu  Leu Glu Tyr Phe Pro  Glu Thr Asp
    1190             1195             1200

aca gta  tgg att gag att gga  gaa acg gaa gga aag  ttt att gta        3654
Thr Val  Trp Ile Glu Ile Gly  Glu Thr Glu Gly Lys  Phe Ile Val
    1205             1210             1215

gat agc  gtg gaa tta ctc ctc  atg gaa gaa tag                         3687
Asp Ser  Val Glu Leu Leu Leu  Met Glu Glu
    1220             1225


<210>  2
<211>  1228
<212>  PRT
<213>  Bacillus thuringiensis

<400>  10

Leu Thr Ser Asn Arg Lys Asn Glu Asn Glu Ile Ile Asn Ala Val Ser
1               5                   10                  15


Asn His Ser Ala Gln Met Asp Leu Leu Pro Asp Ala Arg Ile Glu Asp
            20                  25                  30


Ser Leu Cys Ile Ala Glu Gly Asn Asn Ile Asp Pro Phe Val Ser Ala
            35                  40                  45


Ser Thr Val Gln Thr Gly Ile Asn Ile Ala Gly Arg Ile Leu Gly Val
    50                  55                  60


Leu Gly Val Pro Phe Ala Gly Gln Leu Ala Ser Phe Tyr Ser Phe Leu
65                  70                  75                  80


Val Gly Glu Leu Trp Pro Arg Gly Arg Asp Gln Trp Glu Ile Phe Leu
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                85                      90                      95


Glu His Val Glu Gln Leu Ile Asn Gln Gln Ile Thr Glu Asn Ala Arg
            100             105             110


Asn Thr Ala Leu Ala Arg Leu Gln Gly Leu Gly Asp Ser Phe Arg Ala
            115             120             125


Tyr Gln Gln Ser Leu Glu Asp Trp Leu Glu Asn Arg Asp Asp Ala Arg
        130             135             140


Thr Arg Ser Val Leu His Thr Gln Tyr Ile Ala Leu Glu Leu Asp Phe
145             150             155             160


Leu Asn Ala Met Pro Leu Phe Ala Ile Arg Asn Gln Glu Val Pro Leu
                165             170             175


Leu Met Val Tyr Ala Gln Ala Ala Asn Leu His Leu Leu Leu Leu Arg
            180             185             190


Asp Ala Ser Leu Phe Gly Ser Glu Phe Gly Leu Thr Ser Gln Glu Ile
            195             200             205


Gln Arg Tyr Tyr Glu Arg Gln Val Glu Arg Thr Arg Asp Tyr Ser Asp
        210             215             220


Tyr Cys Val Glu Trp Tyr Asn Thr Gly Leu Asn Ser Leu Arg Gly Thr
225             230             235             240


Asn Ala Ala Ser Trp Val Arg Tyr Asn Gln Phe Arg Arg Asp Leu Thr
                245             250             255


Leu Gly Val Leu Asp Leu Val Ala Leu Phe Pro Ser Tyr Asp Thr Arg
            260             265             270


Thr Tyr Pro Ile Asn Thr Ser Ala Gln Leu Thr Arg Glu Val Tyr Thr
            275             280             285


Asp Ala Ile Gly Ala Thr Gly Val Asn Met Ala Ser Met Asn Trp Tyr
        290             295             300
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Asn Asn Asn Ala Pro Ser Phe Ser Ala Ile Glu Ala Ala Ala Ile Arg
305   310   315   320

Ser Pro His Leu Leu Asp Phe Leu Glu Gln Leu Thr Ile Phe Ser Ala
                325   330   335

Ser Ser Arg Trp Ser Asn Thr Arg His Met Thr Tyr Trp Arg Gly His
            340   345   350

Thr Ile Gln Ser Arg Pro Ile Gly Gly Gly Leu Asn Thr Ser Thr His
        355   360   365

Gly Ala Thr Asn Thr Ser Ile Asn Pro Val Thr Leu Arg Phe Ala Ser
    370   375   380

Arg Asp Val Tyr Arg Thr Glu Ser Tyr Ala Gly Val Leu Leu Trp Gly
385   390   395   400

Ile Tyr Leu Glu Pro Ile His Gly Val Pro Thr Val Arg Phe Asn Phe
            405   410   415

Thr Asn Pro Gln Asn Ile Ser Asp Arg Gly Thr Ala Asn Tyr Ser Gln
            420   425   430

Pro Tyr Glu Ser Pro Gly Leu Gln Leu Lys Asp Ser Glu Thr Glu Leu
        435   440   445

Pro Pro Glu Thr Thr Glu Arg Pro Asn Tyr Glu Ser Tyr Ser His Arg
    450   455   460

Leu Ser His Ile Gly Ile Ile Leu Gln Ser Arg Val Asn Val Pro Val
465   470   475   480

Tyr Ser Trp Thr His Arg Ser Ala Asp Arg Thr Asn Thr Ile Gly Pro
            485   490   495

Asn Arg Ile Thr Gln Ile Pro Met Val Lys Ala Ser Glu Leu Pro Gln
        500   505   510

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Gly Thr Thr Val Val Arg Gly Pro Gly Phe Thr Gly Gly Asp Ile Leu
    515                 520                 525


Arg Arg Thr Asn Thr Gly Gly Phe Gly Pro Ile Arg Val Thr Val Asn
    530                 535                 540


Gly Pro Leu Thr Gln Arg Tyr Arg Ile Gly Phe Arg Tyr Ala Ser Thr
545                 550                 555                 560


Val Asp Phe Asp Phe Phe Val Ser Arg Gly Gly Thr Thr Val Asn Asn
                565                 570                 575


Phe Arg Phe Leu Arg Thr Met Asn Ser Gly Asp Glu Leu Lys Tyr Gly
            580                 585                 590


Asn Phe Val Arg Arg Ala Phe Thr Thr Pro Phe Thr Phe Thr Gln Ile
        595                 600                 605


Gln Asp Ile Ile Arg Thr Ser Ile Gln Gly Leu Ser Gly Asn Gly Glu
    610                 615                 620


Val Tyr Ile Asp Lys Ile Glu Ile Ile Pro Val Thr Ala Thr Phe Glu
625                 630                 635                 640


Ala Glu Tyr Asp Leu Glu Arg Ala Gln Glu Ala Val Asn Ala Leu Phe
                645                 650                 655


Thr Asn Thr Asn Pro Arg Arg Leu Lys Thr Asp Val Thr Asp Tyr His
            660                 665                 670


Ile Asp Gln Val Ser Asn Leu Val Ala Cys Leu Ser Asp Glu Phe Cys
        675                 680                 685


Leu Asp Glu Lys Arg Glu Leu Leu Glu Lys Val Lys Tyr Ala Lys Arg
    690                 695                 700


Leu Ser Asp Glu Arg Asn Leu Leu Gln Asp Pro Asn Phe Thr Ser Ile
705                 710                 715                 720


Asn Lys Gln Pro Asp Phe Ile Ser Thr Asn Glu Gln Ser Asn Phe Thr
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                725                     730                     735


Ser Ile His Glu Gln Ser Glu His Gly Trp Trp Gly Ser Glu Asn Ile
        740                 745                 750


Thr Ile Gln Glu Gly Asn Asp Val Phe Lys Glu Asn Tyr Val Thr Leu
        755                 760                 765


Pro Gly Thr Phe Asn Glu Cys Tyr Pro Thr Tyr Leu Tyr Gln Lys Ile
        770                 775                 780


Gly Glu Ser Glu Leu Lys Ala Tyr Thr Arg Tyr Gln Leu Arg Gly Tyr
785                 790                 795                 800


Ile Glu Asp Ser Gln Asp Leu Glu Ile Tyr Leu Ile Arg Tyr Asn Ala
                805                 810                 815


Lys His Glu Thr Leu Asp Val Pro Gly Thr Glu Ser Leu Trp Pro Leu
            820                 825                 830


Ser Val Glu Ser Pro Ile Gly Arg Cys Gly Glu Pro Asn Arg Cys Ala
            835                 840                 845


Pro His Phe Glu Trp Asn Pro Asp Leu Asp Cys Ser Cys Arg Asp Gly
            850                 855                 860


Glu Lys Cys Ala His His Ser His His Phe Ser Leu Asp Ile Asp Val
865                 870                 875                 880


Gly Cys Thr Asp Leu His Glu Asn Leu Gly Val Trp Val Val Phe Lys
                885                 890                 895


Ile Lys Thr Gln Glu Gly His Ala Arg Leu Gly Asn Leu Glu Phe Ile
            900                 905                 910


Glu Glu Lys Pro Leu Leu Gly Glu Ala Leu Ser Arg Val Lys Arg Ala
            915                 920                 925


Glu Lys Lys Trp Arg Asp Lys Arg Glu Lys Leu Gln Leu Glu Thr Lys
            930                 935                 940
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Arg Val Tyr Thr Glu Ala Lys Glu Ala Val Asp Ala Leu Phe Val Asp
945             950             955                 960

Ser Gln Tyr Asp Arg Leu Gln Ala Asp Thr Asn Ile Gly Met Ile His
            965             970                 975

Ala Ala Asp Lys Leu Val His Arg Ile Arg Glu Ala Tyr Leu Ser Glu
        980             985                 990

Leu Pro Val Ile Pro Gly Val Asn  Ala Glu Ile Phe Glu  Glu Leu Glu
        995             1000                1005

Gly His  Ile Ile Thr Ala Ile  Ser Leu Tyr Asp Ala  Arg Asn Val
        1010            1015            1020

Val Lys  Asn Gly Asp Phe Asn  Asn Gly Leu Thr Cys  Trp Asn Val
        1025            1030            1035

Lys Gly  His Val Asp Val Gln  Gln Ser His His Arg  Ser Asp Leu
        1040            1045            1050

Val Ile  Pro Glu Trp Glu Ala  Glu Val Ser Gln Ala  Val Arg Val
        1055            1060            1065

Cys Pro  Gly Cys Gly Tyr Ile  Leu Arg Val Thr Ala  Tyr Lys Glu
        1070            1075            1080

Gly Tyr  Gly Glu Gly Cys Val  Thr Ile His Glu Ile  Glu Asn Asn
        1085            1090            1095

Thr Asp  Glu Leu Lys Phe Lys  Asn Arg Glu Glu Glu  Glu Val Tyr
        1100            1105            1110

Pro Thr  Asp Thr Gly Thr Cys  Asn Asp Tyr Thr Ala  His Gln Gly
        1115            1120            1125

Thr Ala  Gly Cys Ala Asp Ala  Cys Asn Ser Arg Asn  Ala Gly Tyr
        1130            1135            1140
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Glu Asp  Ala Tyr Glu Val Asp  Thr Thr Ala Ser Val  Asn Tyr Lys
    1145             1150             1155

Pro Thr  Tyr Glu Glu Glu Thr  Tyr Thr Asp Val Arg  Arg Asp Asn
    1160             1165             1170

His Cys  Glu Tyr Asp Arg Gly  Tyr Val Asn Tyr Pro  Pro Val Pro
    1175             1180             1185

Ala Gly  Tyr Val Thr Lys Glu  Leu Glu Tyr Phe Pro  Glu Thr Asp
    1190             1195             1200

Thr Val  Trp Ile Glu Ile Gly  Glu Thr Glu Gly Lys  Phe Ile Val
    1205             1210             1215

Asp Ser  Val Glu Leu Leu Leu  Met Glu Glu
    1220             1225
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